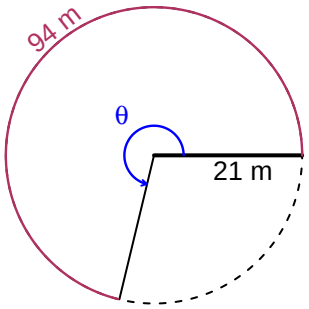
Name: Date:

Trig Final (SLTN v613)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 21 meters. The arc length is 94 meters. What is the angle measure in radians?

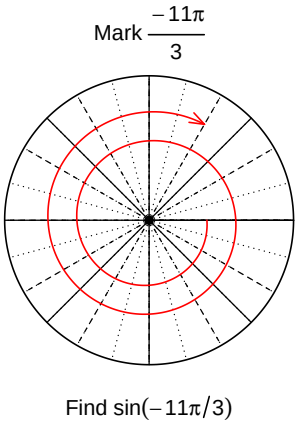


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

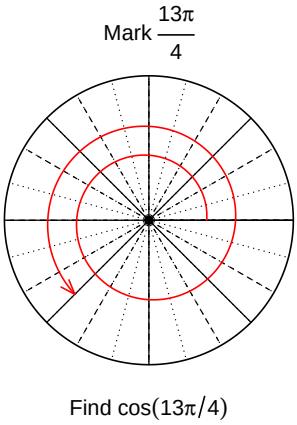
$\theta = 4.476$ radians.

Question 2

Consider angles $\frac{-11\pi}{3}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{3}\right)$ and $\cos\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-11\pi/3)$



Find $\cos(13\pi/4)$

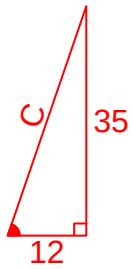
$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-35}{12}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

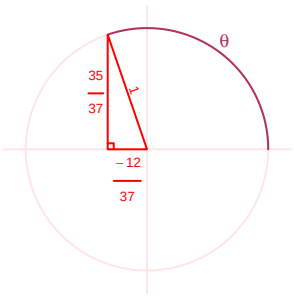
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + 35^2 = C^2$$
$$C = \sqrt{12^2 + 35^2}$$
$$C = 37$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-12}{37}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.24 Hz, an amplitude of 4.15 meters, and a midline at $y = 8.49$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.15\sin(2\pi 2.24t) + 8.49$$

or

$$y = -4.15\sin(4.48\pi t) + 8.49$$

or

$$y = -4.15\sin(14.07t) + 8.49$$